 <b>MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION, MUMBAI</b> <b>TEACHING AND EXAMINATION SCHEME FOR POST S.S.C. DIPLOMA COURSES</b>																	
<b>COURSE NAME : ELECTRONICS ENGINEERING GROUP</b>																	
<b>COURSE CODE : EJ/ET/EX/EN/ED/EI</b>																	
<b>DURATION OF COURSE : 6 SEMESTERS for ET/EN/EX/EJ and 8 SEMESTERS for ED/EI</b>												<b>WITH EFFECT FROM 2012-13</b>					
<b>SEMESTER : FOURTH</b>												<b>DURATION : 16 WEEKS</b>					
<b>FULL TIME / PART TIME : FULL TIME</b>												<b>SCHEME : G</b>					
SR. NO.	SUBJECT TITLE	Abbreviation	SUB CODE	TEACHING SCHEME			EXAMINATION SCHEME										SW (17400)
				TH	TU	PR	PAPER HRS.	TH (1)		PR (4)		OR (8)		TW (9)			
								Max	Min	Max	Min	Max	Min	Max	Min		
1	Environmental Studies \$	EST	17401	01	--	02	01	50#*	20	--	--	--	--	25@	10	50	
2	Industrial Measurements β	IME	17434	03		02	03	100	40	--	--	--	--	25@	10		
3	Analog Communication	ACO	17440	03		02	03	100	40	25#	10	--	--	25@	10		
4	Power Electronics	PEL	17444	03		02	03	100	40	25#	10	--	--	25@	10		
5	Linear Integrated Circuits β	LIC	17445	04	--	02	03	100	40	50#	20	--	--	25@	10		
6	Visual Basic β	VBA	17043	01		02	--	--	--	--	--	--	--	25@	10		
7	Professional Practices-II β	PPT	17044	--	--	03	--	--	--	--	--	--	--	50@	20		
<b>TOTAL</b>				<b>15</b>	<b>--</b>	<b>15</b>	<b>--</b>	<b>450</b>	<b>--</b>	<b>100</b>	<b>--</b>	<b>--</b>	<b>--</b>	<b>200</b>	<b>--</b>	<b>50</b>	
**	<b>Industrial Training (Optional)</b>			<b>Examination in 5<sup>th</sup> Semester Professional Practices-III</b>													
<p>Student Contact Hours Per Week: <b>30 Hrs.</b></p> <p><b>THEORY AND PRACTICAL PERIODS OF 60 MINUTES EACH.</b></p> <p>Total Marks : <b>800</b></p> <p>@- Internal Assessment, # - External Assessment, <span style="background-color: #cccccc; border: 1px solid black; display: inline-block; width: 20px; height: 15px;"></span> No Theory Examination, \$ - Common to all branches, #* - Online Theory Examination, β - Common to DE / EV / MU</p> <p>Abbreviations: TH-Theory, TU- Tutorial, PR-Practical, OR-Oral, TW- Term Work, SW- Sessional Work.</p> <p><b>** Industrial Training (Optional) - Student can undergo Industrial Training of four weeks after fourth semester examination during summer vacation.</b></p> <p><b>Assessment will be done in Fifth semester under Professional Practices-III. They will be exempted from activities of Professional Practices-III of 5<sup>th</sup> Semester.</b></p> <ul style="list-style-type: none"> <li>➤ Conduct two class tests each of 25 marks for each theory subject. Sum of the total test marks of all subjects is to be converted out of 50 marks as sessional work (SW).</li> <li>➤ Progressive evaluation is to be done by subject teacher as per the prevailing curriculum implementation and assessment norms.</li> <li>➤ Code number for TH, PR, OR and TW are to be given as suffix 1, 4, 8, 9 respectively to the subject code.</li> </ul>																	

**Course Name : All Branches of Diploma in Engineering & Technology**

**Course Code : AE/CE/CM/CO/CR/CS/CW/DE/EE/EP/IF/EJ/EN/ET/EV/EX/IC/IE/IS/  
ME/MU/PG/PT/PS/CD/CV/ED/EI/FE/IU/MH/MI/DC/TC/TX/FG/AU**

**Semester : Fourth**

**Subject Title : Environmental Studies**

**Subject Code : 17401**

**Teaching and Examination Scheme:**

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
01	--	02	01	50#*	--	--	25@	75

**#\* Online Theory Examination**

**NOTE:**

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work (SW).**

**Rationale:**

Environment essentially comprises of our living ambience, which gives us the zest and verve in all our activities. The turn of the twentieth century saw the gradual onset of its degradation by our callous deeds without any concern for the well being of our surrounding we are today facing a grave environmental crisis. The unceasing industrial growth and economic development of the last 300 years or so have resulted in huge ecological problems such as overexploitation of natural resources, degraded land, disappearing forests, endangered species, dangerous toxins, global warming etc.

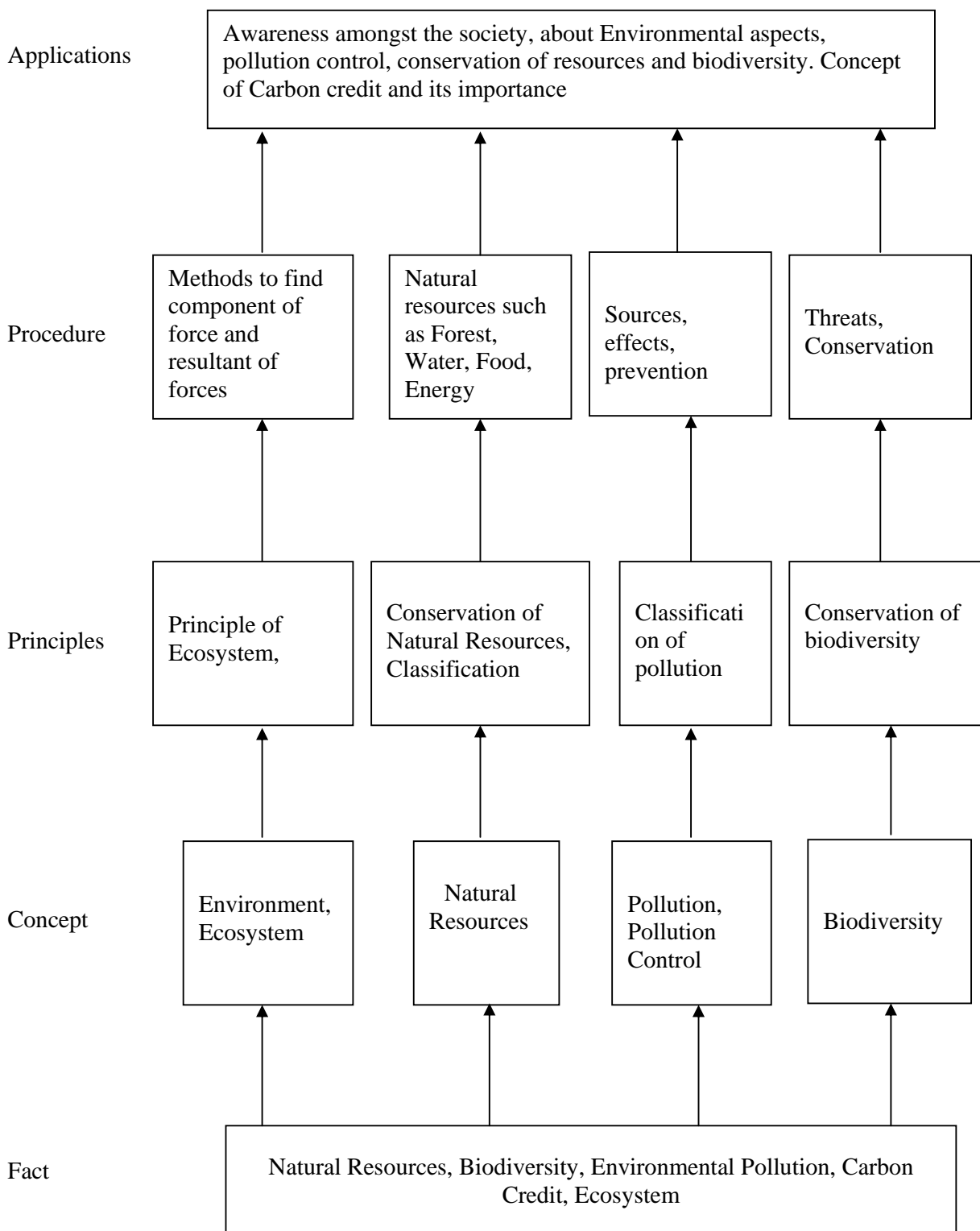
It is therefore necessary to study environmental issues to realize how human activities affect the environment and what could be possible remedies or precautions which need to be taken to protect the environment.

The curriculum covers the aspects about environment such as Environment and Ecology, Environmental impacts on human activities, Water resources and water quality, Mineral resources and mining, Forests, etc.

**General Objectives:** The student will be able to,

1. Understand importance of environment
2. Know key issues about environment
3. Understands the reasons for environment degradation
4. Know aspects about improvement methods
5. Know initiatives taken by the world bodies to restrict and reduce degradation

**Learning Structure:**



**Theory:**

<b>Topic and Contents</b>	<b>Hours</b>	<b>Marks</b>
<p><b>Topic 1: Nature of Environmental Studies</b></p> <p>Specific Objectives:</p> <ul style="list-style-type: none"> <li>➤ Define the terms related to Environmental Studies</li> <li>➤ State importance of awareness about environment in general public</li> </ul> <p><b>Contents:</b></p> <ul style="list-style-type: none"> <li>• Definition, Scope and Importance of the environmental studies</li> <li>• Importance of the studies irrespective of course</li> <li>• Need for creating public awareness about environmental issues</li> </ul>	01	04
<p><b>Topic 2: Natural Resources and Associated Problems</b></p> <p>Specific Objectives:</p> <ul style="list-style-type: none"> <li>➤ Define natural resources and identify problems associated with them</li> <li>➤ Identify uses and their overexploitation</li> <li>➤ Identify alternate resources and their importance for environment</li> </ul> <p><b>Contents:</b></p> <p>2.1 Renewable and Non renewable resources</p> <ul style="list-style-type: none"> <li>• Definition</li> <li>• Associated problems</li> </ul> <p>2.2 Forest Resources</p> <ul style="list-style-type: none"> <li>• General description of forest resources</li> <li>• Functions and benefits of forest resources</li> <li>• Effects on environment due to deforestation, Timber extraction, Building of dams, waterways etc.</li> </ul> <p>2.3 Water Resources</p> <ul style="list-style-type: none"> <li>• Hydrosphere: Different sources of water</li> <li>• Use and overexploitation of surface and ground water</li> <li>• Effect of floods, draught, dams etc. on water resources and community</li> </ul> <p>2.4 Mineral Resources:</p> <ul style="list-style-type: none"> <li>• Categories of mineral resources</li> <li>• Basics of mining activities</li> <li>• Mine safety</li> <li>• Effect of mining on environment</li> </ul> <p>2.5 Food Resources:</p> <ul style="list-style-type: none"> <li>• Food for all</li> <li>• Effects of modern agriculture</li> <li>• World food problem</li> </ul>	04	10
<p><b>Topic 3. Ecosystems</b></p> <ul style="list-style-type: none"> <li>• Concept of Ecosystem</li> <li>• Structure and functions of ecosystem</li> <li>• Energy flow in ecosystem</li> <li>• Major ecosystems in the world</li> </ul>	01	04
<p><b>Topic 4. Biodiversity and Its Conservation</b></p> <ul style="list-style-type: none"> <li>• Definition of Biodiversity</li> <li>• Levels of biodiversity</li> </ul>	02	06

<ul style="list-style-type: none"> <li>• Value of biodiversity</li> <li>• Threats to biodiversity</li> <li>• Conservation of biodiversity</li> </ul>		
<b>Topic 5. Environmental Pollution</b> <ul style="list-style-type: none"> <li>• Definition</li> <li>• Air pollution: Definition, Classification, sources, effects, prevention</li> <li>• Water Pollution: Definition, Classification, sources, effects, prevention</li> <li>• Soil Pollution: Definition, sources, effects, prevention</li> <li>• Noise Pollution: Definition, sources, effects, prevention</li> </ul>	03	08
<b>Topic 6. Social Issues and Environment</b> <ul style="list-style-type: none"> <li>• Concept of development, sustainable development</li> <li>• Water conservation, Watershed management, Rain water harvesting: Definition, Methods and Benefits</li> <li>• Climate Change, Global warming, Acid rain, Ozone Layer Depletion, Nuclear Accidents and Holocaust: Basic concepts and their effect on climate</li> <li>• Concept of Carbon Credits and its advantages</li> </ul>	03	10
<b>Topic 7. Environmental Protection</b> Brief description of the following acts and their provisions: <ul style="list-style-type: none"> <li>• Environmental Protection Act</li> <li>• Air (Prevention and Control of Pollution) Act</li> <li>• Water (Prevention and Control of Pollution) Act</li> <li>• Wildlife Protection Act</li> <li>• Forest Conservation Act</li> </ul> Population Growth: Aspects, importance and effect on environment <ul style="list-style-type: none"> <li>• Human Health and Human Rights</li> </ul>	02	08
<b>Total</b>	<b>16</b>	<b>50</b>

**Practical:****Skills to be developed:****Intellectual Skills:**

1. Collection of information, data
2. Analysis of data
3. Report writing

**Motor Skills:**

1. Presentation Skills
2. Use of multi media

**List of Projects:**

**Note:** Any one project of the following:

1. Visit to a local area to document environmental assets such as river / forest / grassland / hill / mountain
2. Visit to a local polluted site: Urban/Rural/Industrial/Agricultural
3. Study of common plants, insects, birds

4. Study of simple ecosystems of ponds, river, hill slopes etc

**Prepare a project report on the findings of the visit illustrating environment related facts, analysis and conclusion. Also suggest remedies to improve environment.**

**Learning Resources:**

**Books:**

<b>Sr. No.</b>	<b>Author</b>	<b>Title</b>	<b>Publisher</b>
01	Anindita Basak	Environmental Studies	Pearson Education
02	R. Rajgopalan	Environmental Studies from Crises to Cure	Oxford University Press
03	Dr. R. J. Ranjit Daniels, Dr. Jagdish Krishnaswamy	Environmental Studies	Wiley India

**Course Name : Electronics Engineering Group**

**Course Code : EJ/EX/ET/EN/IS/IC/IE/IU**

**Semester : Fourth**

**Subject Title : Industrial Measurements**

**Subject Code : 17434**

**Teaching and Examination Scheme:**

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
03	--	02	03	100	--	--	25@	125

**NOTE:**

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work (SW).**

**Rationale:**

The science of instrumentation system plays vital role in the development of technology. An electronic system has prime importance in the field of instrumentation. Most of the physical parameters can be converted into electrical signal with the use of transducers. The obtained electrical signal can be conditioned, processed, displayed and controlled with the use of advanced control system.

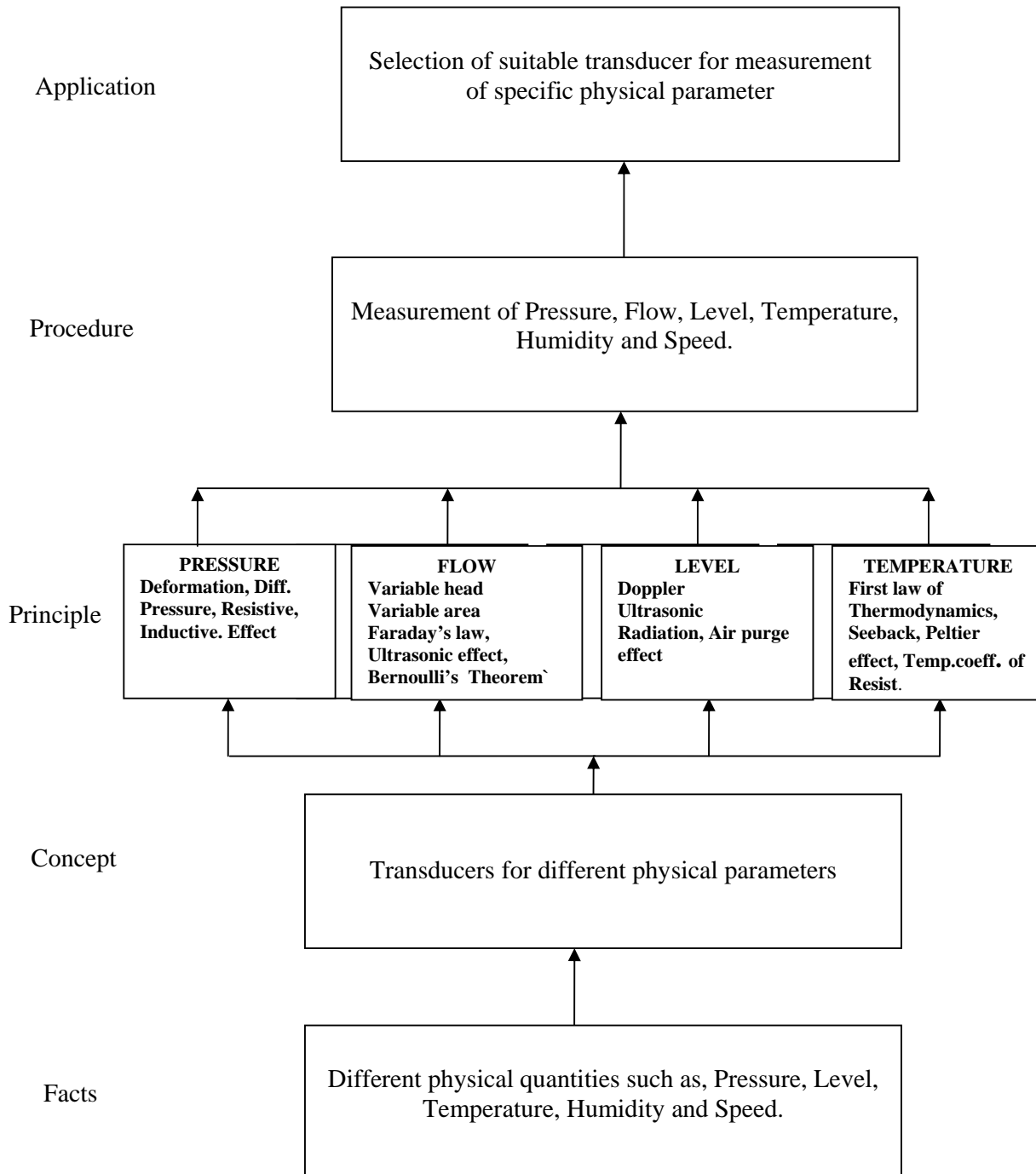
With the background of measuring instruments, this subject deals with measurement of different physical parameters like temperature, pressure etc. covering the entire gamut of industrial measurement. Different types of transducers used for measurement of different physical quantities with their construction, working principle, advantages, and disadvantages are studied through this subject.

**General Objectives:**

After studying this subject the students will be able to:

- 1) Understand the nature and working of instrumentation system used in industrial & general applications.
- 2) Classify the physical parameters with their proper units
- 3) Understand the concepts of different types of transducers

**Learning Structure:**





**Theory Contents:**

Topic No	Theory	Hrs.	Marks
1	<p><b>Transducers:</b>  <b>Specific Objectives:</b></p> <ul style="list-style-type: none"> <li>➤ Draw and describe the block diagram of Instrumentation system.</li> <li>➤ Compare different Transducers</li> <li>➤ Draw and describe different Electronic Transducers.</li> </ul> <p><b>Contents</b></p> <ul style="list-style-type: none"> <li>• Instrumentation System: Block diagram of Instrumentation system: Function of each block, Explanation of basic instrumentation systems</li> <li>• Transducer: Need of Transducer: Classification of transducers: Active and Passive, Analog and Digital, Primary and Secondary.</li> <li>• Electrical Transducers: Resistive transducers- Linear &amp; Angular potentiometers Capacitive transducer Inductive transducer –LVDT, RVDT ( As a displacement transducer) Piezoelectric transducer (Principle of operation and applications of above)</li> <li>• Selection criterion of transducers</li> </ul>	08	16
2	<p><b>Pressure measurement</b></p> <ul style="list-style-type: none"> <li>➤ Draw and describe the non-elastic and elastic pressure transducers.</li> <li>➤ Draw and describe electronic pressure transducers.</li> <li>➤ Write procedure of calibration of elastic pressure gauges using dead weight tester.</li> </ul> <p><b>Contents</b></p> <ul style="list-style-type: none"> <li>• Pressure: Definition Types - Absolute, Gauge, Atmospheric, Vacuum( Definition, Units)</li> <li>• Classification of Pressure measuring devices</li> <li>• Non elastic pressure transducer: U tube Inclined Tube Well type manometer</li> <li>• Elastic pressure transducer: Bourdon Tube Bellows Diaphragm Capsule</li> <li>• Electronic pressure transducers: Bourdon tube with LVDT Diaphragm with Strain gauge</li> </ul>	08	20

	<ul style="list-style-type: none"> <li>• Calibration of pressure gauge using dead weight tester</li> </ul> <p><b>Note:</b> Each transducer should be studied on the basis of working principle, construction, advantages, disadvantages and applications.</p>		
3	<p><b>Flow Measurement</b></p> <ul style="list-style-type: none"> <li>➤ <b>List Of different types of flow.</b></li> <li>➤ <b>List of different types of flow measuring transducers.</b></li> <li>➤ <b>Draw and describe construction and working of different Flow measuring transducers.</b></li> </ul> <p><b>Contents</b></p> <ul style="list-style-type: none"> <li>• Flow: <ul style="list-style-type: none"> <li>Definition</li> <li>Types of Flow –Laminar, turbulent , Reynolds number</li> </ul> </li> <li>• Classification of flow measuring transducers : <ul style="list-style-type: none"> <li>Variable head flow meter- Venturimeter, orifice plate meter</li> <li>Variable area flow meter – Rota meter</li> <li>Electromagnetic Flow meter</li> <li>Ultrasonic flow meter- Doppler Type</li> </ul> </li> </ul> <p><b>Note:</b> Each transducer should be studied on the basis of working principle, construction, advantages, disadvantages and applications.</p>	06	14
4	<p><b>Level Measurement</b></p> <ul style="list-style-type: none"> <li>➤ <b>State the need of level measurement.</b></li> <li>➤ <b>List of different level measuring methods.</b></li> <li>➤ <b>Draw the construction and describe working of Level measuring transducers.</b></li> </ul> <p><b>Contents</b></p> <ul style="list-style-type: none"> <li>• Level: <ul style="list-style-type: none"> <li>Definition</li> <li>Need of level measurement</li> </ul> </li> <li>• Classification of level measurement methods: <ul style="list-style-type: none"> <li>Float type – linear &amp; rotary potentiometer ( Contact type)</li> <li>Capacitive type (Contact type)</li> <li>Ultrasonic type (Non-contact type)</li> <li>Radiation type (Non-contact type)</li> <li>RADAR type (Non-contact type)</li> </ul> </li> </ul> <p><b>Note:</b> Each transducer should be studied on the basis of working principle, construction, advantages, disadvantages and applications.</p>	08	16
5	<p><b>Temperature measurement</b></p> <ul style="list-style-type: none"> <li>➤ <b>List different temperature measuring scales and its conversions.</b></li> <li>➤ <b>List different temperature measuring transducers.</b></li> <li>➤ <b>Draw the construction and describe working of different temperature transducers.</b></li> </ul> <p><b>Contents</b></p> <ul style="list-style-type: none"> <li>• Temperature : <ul style="list-style-type: none"> <li>Definition and units</li> <li>Different temperature scales &amp; their conversions</li> </ul> </li> <li>• Classification of temperature measuring transducers: <ul style="list-style-type: none"> <li>Gas Filled thermometer.</li> </ul> </li> </ul>	10	20

	Bimetallic thermometer Thermistors RTD – (PT-100) , 2 wire systems ( circuit diagram only ) Thermocouple – Seeback & Peltier effect , Types J, K, R , S, T ( Based on material, temperature ranges) Pyrometer - Optical, Radiation <u>Note:</u> Each transducer should be studied on the basis of working principle, construction, advantages, disadvantages and applications.		
6	<b>Special Transducers and Measurements</b> <ul style="list-style-type: none"> <li>➤ List different types of humidity and its units.</li> <li>➤ Draw the construction and describe working of Humidity transducers.</li> <li>➤ Draw the construction and describe working of Speed measuring transducers.</li> </ul> <b>Contents</b> <ul style="list-style-type: none"> <li>• Humidity:             <ul style="list-style-type: none"> <li>Definition</li> <li>Types - Absolute, relative</li> </ul> </li> <li>• Humidity measurement devices:             <ul style="list-style-type: none"> <li>Psychrometer - Dry &amp; wet Bulb thermometer type</li> <li>Hygrometer- hair type ,</li> </ul> </li> <li>• Speed             <ul style="list-style-type: none"> <li>Definition</li> <li>Classification of speed measurement methods</li> <li>Photoelectric pick-up (Non contact type)</li> </ul> </li> </ul> <u>Note:</u> Each transducer should be studied on the basis of working principle, construction, advantages, disadvantages and applications.	08	14
<b>Total</b>		<b>48</b>	<b>100</b>

**Practical:****Skills to be developed:****Intellectual Skills:**

- Selection of transducer based on application.
- Interpretation of results.

**Motor Skills:**

- Connection of different transducers with measuring system.
- Measurement of various physical parameters using transducers.
- Observation and plotting the characteristics.

**List of Practicals:**

Sr. No.	Title of the Experiment
1	Measure displacement using LVDT
2	Measure weight using strain gauge pressure transducer with cantilever setup
3	Measure pressure using Bourdon tube pressure gauge

4	Calibrate pressure gauge using Dead weight pressure gauge tester
5	Determine the rate of flow of liquid in pipe using Rotameter
6	Calculate flow through pipe using orifice meter
7	Measure temperature of liquid using Resistance Temperature Detector (PT 100)
8	Measure temperature of liquid using thermocouple
9	Observe and interpret humidity of air using wet and dry bulb Hygrometer
10	Measure speed of motor using non contact type photo electric tachometer.

### Learning Resources:

#### 1. Books:

Sr. No.	Author	Title	Publisher
01	A.K.Sawhney	Electrical and Electronic Measurements and Instrumentation	Dhanpat Rai & Sons.
02	S.K.Singh	Industrial Instrumentation & Control	Tata McGraw Hill Publishing Co. Ltd; N. Delhi
03	D. Patranabis	Principles of Industrial Instrumentation	Tata McGraw Hill Publishing Co. Ltd; N. Delhi
04	Rangan Mani Sharma	Instrumentation Systems and Devices	Tata McGraw Hill Publishing Co. Ltd; N. Delhi
05	Bela Liptak Kriszta Venczel	Process Measurement Instrument Engineers Handbook	Chilton Book Co.
06	B.C.Nakra K.K.Chaudhry	Instrumentation Measurement and Analysis	Tata McGraw Hill Publishing Co. Ltd; N. Delhi.

#### 2. CD/ PPTs etc.:

- [www.proprofs.com/webschool](http://www.proprofs.com/webschool)
- [www.osvn.com](http://www.osvn.com)

#### 3. Websites

- <http://en.wikipedia.org/wiki/>
- [www.youtube.com/](http://www.youtube.com/) “here type name of instrument”
- [www.controlnet.com](http://www.controlnet.com)

**Course Name** : Electronics Engineering Group  
**Course Code** : EJ/EX/ET/EN/IS/IC/IE/IU  
**Semester** : Fourth  
**Subject Title** : Analog Communication  
**Subject Code** : 17440

**Teaching and Examination Scheme:**

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
03	--	02	03	100	25#	--	25@	150

**NOTE:**

- Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.
- Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work (SW).

**Rationale:**

Electronic Communication plays vital role in our lives. Development of communication Technology has increased its application in allied field of electronics including Telephony, telegraphy, satellite , Mobile, RADAR, industrial controls, online application like internet banking, ATM machine, Wireless network, optical communication, Mobile communication system.

Analog communication is a foundation for all advanced subjects in communication engineering. This subject will focus on the operation of analog transmission and reception techniques. This subject also deals with pulse modulation and their different types.

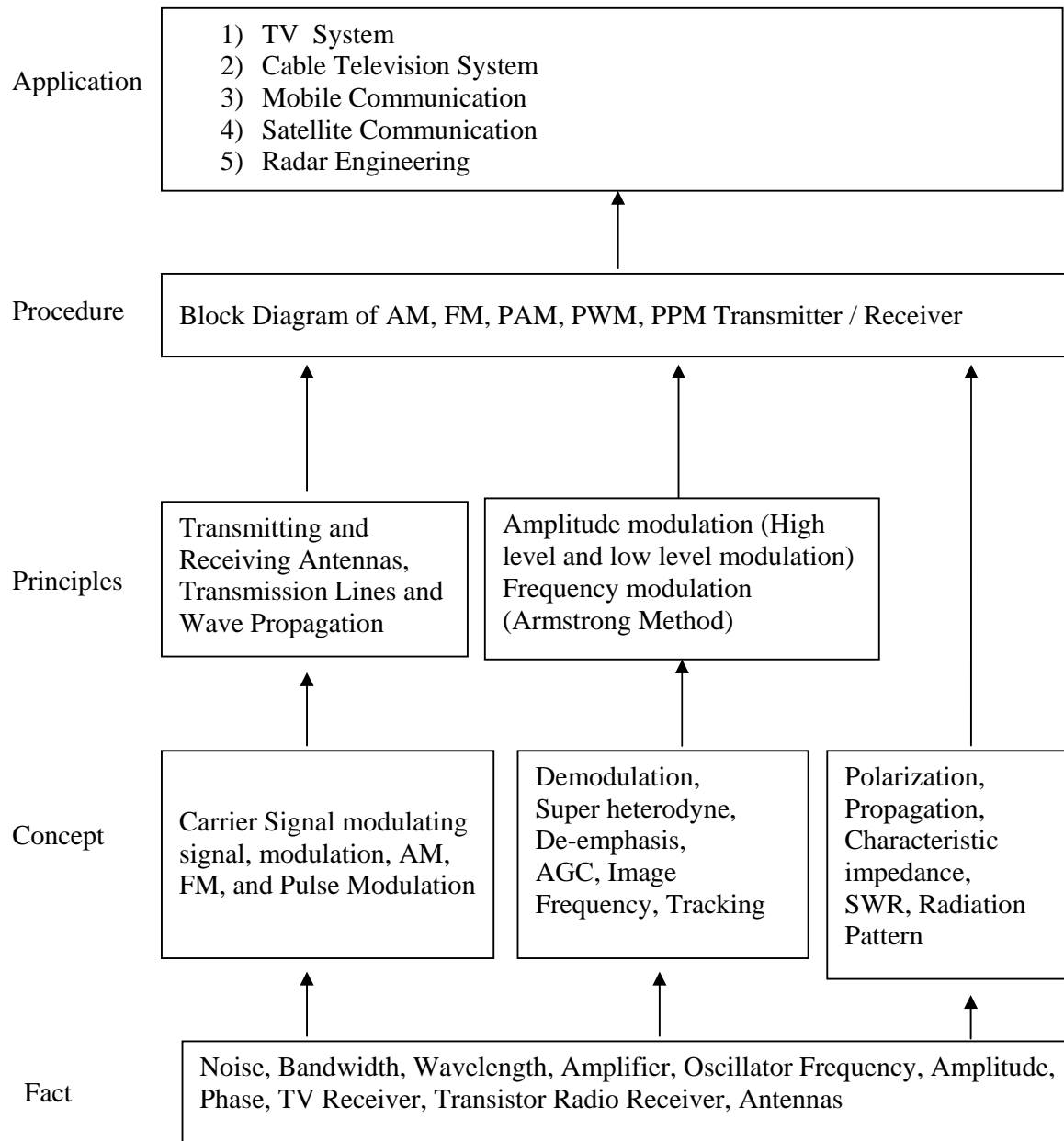
Study of Elements of Electronics, Electronic Devices and Circuits is prerequisite for Analog communication subject.

**General Objectives:**

The student will able to

1. Know different electronic communication systems.
2. Understand concept of modulation and demodulation of AM / FM.
3. Understand the operation of AM/ FM transmitter and receiver.
4. Understand the concept of radio wave propagation.

**Learning Structure:**



**Theory Contents:**

Topic No	Theory	Hrs.	Marks
1	<p><b>Basics of Electronic Communication.</b></p> <p>Specific Objectives: Student will be able to-</p> <ul style="list-style-type: none"> <li>➤ Draw block diagram of electronic communication system</li> <li>➤ Identify types of electronic communication systems.</li> <li>➤ Draw electromagnetic spectrum.</li> </ul> <p>Contents:</p> <ul style="list-style-type: none"> <li>• The importance of electronic communication.</li> <li>• Definition: Analog signal, Digital signal, Baseband signal</li> <li>• The elements of basic electronic communication system (Draw block diagram and explain each block.):</li> <li>• Noise in communication system and types</li> <li>• Types of electronic communication. Simplex, Duplex- full / half.</li> <li>• The electromagnetic spectrum.</li> <li>• Concept of transmission bandwidth.</li> </ul>	04	06
2	<p><b>Modulation Techniques</b></p> <p>Specific Objectives:</p> <ul style="list-style-type: none"> <li>➤ State the importance of modulation.</li> <li>➤ Explain the process of different modulation techniques.</li> <li>➤ Compute the modulation index.</li> <li>➤ Differentiate between CW and pulse modulation techniques.</li> </ul> <p>Contents:</p> <p>2.1 Basics of Modulation [04]</p> <ul style="list-style-type: none"> <li>• Need for modulation</li> <li>• Types: AM, FM, PM. Definition ,waveforms</li> </ul> <p>2.2 Amplitude Modulation [06]</p> <ul style="list-style-type: none"> <li>• Modulation index-definition, its effect on modulated signal, simple numerical.</li> <li>• Mathematical representation of amplitude modulated wave &amp; its meaning., concepts of side band (SSB,DSB)</li> <li>• Bandwidth requirement</li> <li>• Block diagram of AM transmitter and its operation</li> <li>• Representation of AM signal in time &amp; frequency domain</li> <li>• Power relations in AM wave, simple numerical</li> <li>• Circuit and operation of AM modulators using BJT/FET</li> </ul> <p>2.3 Frequency modulation [08]</p> <ul style="list-style-type: none"> <li>• Deviation ratio, maximum deviation ratio, mathematical representation of FM &amp; its meaning</li> <li>• Representation of FM signal in time domain &amp; frequency domain</li> <li>• Bandwidth requirements and simple numerical</li> <li>• Concept of Pre-emphasis &amp; De-emphasis</li> <li>• Generation of FM -Reactance modulator, varactor diode modulator, Armstrong: circuit diagram and its working</li> <li>• FM signal generation using ICs 566,564</li> </ul> <p>2.4 Pulse Modulation Techniques. [06]</p>	12	24

	<ul style="list-style-type: none"> <li>• Need of Pulse Modulation</li> <li>• PAM, PWM, PPM- Block diagram, waveforms, advantages &amp; disadvantages &amp; their comparison.</li> <li>• Generation of PAM transistorized circuit, Generation of PWM, PPM using IC 555.</li> </ul>		
3	<p><b>Radio Receiver</b> Specific Objectives:</p> <ul style="list-style-type: none"> <li>➤ State super heterodyne principle</li> <li>➤ Compare TRF &amp; super heterodyne receivers.</li> <li>➤ Explain the terms Automatic Frequency Control (AFC) and Automatic Gain Control (AGC).</li> </ul> <p>Contents:</p> <p>3.1. Radio Receiver Types: [08]</p> <ul style="list-style-type: none"> <li>• Block diagram of Tuned Radio Frequency receiver and its working with waveforms.</li> <li>• Block diagram of AM superheterodyne receiver and its working with waveforms.</li> <li>• RF Section and Characteristics of AM radio receiver Sensitivity, selectivity, fidelity.</li> <li>• Image frequency and its rejection, Double spotting</li> <li>• Frequency changing and tracking.</li> </ul> <p>3.2. Demodulation of AM signal. [04]</p> <ul style="list-style-type: none"> <li>• Diode detector, practical diode detector.</li> <li>• Need of AGC &amp; its types – simple, delayed.</li> </ul> <p>3.3 FM receiver : [06] Block diagram and explanation of FM Super heterodyne radio receiver with waveforms. Circuit diagram and working of limiter</p> <p>3.4 FM detector Types : [06]</p> <ul style="list-style-type: none"> <li>• Balanced slope detector</li> <li>• Phase Discriminator</li> <li>• Ratio detector.</li> <li>• PLL as FM demodulator.</li> </ul>	14	24
4	<p><b>Topic.4 Transmission line</b> Specific Objectives:</p> <ul style="list-style-type: none"> <li>➤ Explain the theory of transmission line in general.</li> <li>➤ Calculate characteristics impedance of transmission line.</li> <li>➤ Define the terms standing wave, SWR, VSWR.</li> <li>➤ Analyze the properties of impedance matching stubs.</li> </ul> <p>Contents:</p> <p>4.1 Fundamentals of transmission line. [04]</p> <ul style="list-style-type: none"> <li>• Equivalent circuit of transmission line (general, RF equivalents.)</li> <li>• Characteristics impedance and its method of calculation, simple Numerical.</li> <li>• Losses in transmission line.</li> </ul> <p>4.2 Standing waves [08]</p> <ul style="list-style-type: none"> <li>• With load terminals open circuited &amp; short circuited</li> <li>• SWR, VSWR, Reflection coefficient, simple Numerical.</li> <li>• Quarter wave &amp; half wave length line.</li> <li>• Impedance inversion by quarter wave length line.</li> </ul>	08	18



	<ul style="list-style-type: none"> <li>• Quarter wave transformer &amp; impedance matching</li> <li>• Properties of line of various lengths.</li> </ul> <p>4.3 Impedance Matching [06]</p> <ul style="list-style-type: none"> <li>• Stub: single &amp; double.</li> <li>• Baluns</li> </ul>		
5	<p><b>Wave Propagation</b> Specific Objectives:</p> <ul style="list-style-type: none"> <li>➤ Explain the theory of electromagnetic radiation.</li> <li>➤ State different types of wave propagation.</li> <li>➤ Define the various atmospheric layers</li> <li>➤ Define the terms maximum usable frequency, critical frequency, skip distance &amp; fading.</li> </ul> <p>Contents:</p> <p>5.1 Fundamental of electromagnetic waves , Transverse electromagnetic wave, polarization [04]</p> <p>5.2 Types of Wave Propagation [08]</p> <ul style="list-style-type: none"> <li>• Ground Wave.</li> <li>• Sky wave, ionosphere &amp; its effect.</li> <li>• Space Wave , Duct propagation</li> <li>• Troposphere scatter propagation</li> <li>• Concept of actual height &amp; virtual weight</li> <li>• Critical frequency, skip distance &amp; fading, maximum usable frequency.</li> </ul>	04	12
6	<p><b>Antennas.</b> Specific Objectives:</p> <ul style="list-style-type: none"> <li>➤ Define antenna.</li> <li>➤ Define the term related with the antenna.</li> <li>➤ Draw the structure, radiation pattern of antennas.</li> <li>➤ State application of different antennas.</li> </ul> <p>Contents:</p> <p>6.1 Antenna fundamentals : [04]</p> <ul style="list-style-type: none"> <li>• Resonant antenna and Non-resonant antennas</li> <li>• Definition : Radiation pattern ,polarization, bandwidth, beam width, antenna resistance, directivity &amp; power gain, antenna gain</li> </ul> <p>6.2 Dipole antenna [04]</p> <ul style="list-style-type: none"> <li>• Half wave dipole antenna (Resonant Antenna) &amp; its Radiation pattern.</li> <li>• Folded dipole antenna &amp; its radiation pattern.</li> <li>• Radiation pattern for Dipole Antenna of different length.</li> </ul> <p>6.3 Structure, radiation pattern &amp; application of antennas. [08]</p> <ul style="list-style-type: none"> <li>• Loop antenna.</li> <li>• Telescopic antenna.</li> <li>• Yagi-Uda antenna</li> <li>• Micro wave antenna – Dish antenna &amp;Horn antenna</li> <li>• Microstrip patch antennae- Rectangular, square and circular</li> </ul>	06	16
<b>Total</b>		<b>48</b>	<b>100</b>

**Practical:****Intellectual Skills:**

1. Interpret the output results

**Motor Skills:**

1. Testing and observing the waveforms at various stages
2. Fault finding
3. Measurement of different parameters like sensitivity, selectivity, fidelity
4. Small circuit development

**List of Practical's**

Sr. No.	Title of the Experiment
01	Observe and draw the waveform of AM and calculate modulation index of AM.
02	Observe and draw input / output waveforms of AM detector.
03	Observe and draw the waveform of FM and calculate modulation index of FM.
04	Observe and draw the waveforms of FM modulator using IC 566.
05	Observe and draw the waveforms of FM demodulator using IC 564 / IC 565.
06	Observe the waveforms at various points in AM receiver. Trouble shooting and fault finding in AM receiver.
07	Observe and plot the graph of RF characteristics of Radio Receiver: Sensitivity & Fidelity
08	Generate PAM and observe the waveforms of PAM.
09	Generate PWM, PPM and observe the waveforms of PWM, PPM using IC's.
10	Plot the radiation pattern of dipole and Yagi-Uda antenna.
11	Measure the characteristic impedance of co-axial cable. Find the impedance and VSWR.
12	Visit to the Radio Transmitter station and write a Transmitter specification.

**Learning Resources:****1. Books:**

Sr. No.	Author	Title	Publisher
01	George Kennedy, Bernard Davis, SRM Prasanna	Electronic Communication Systems	TATA Mc-Graw Hill 5 <sup>th</sup> Edition
02	Louis E Frenzel	Communication Electronics	TATA Mc-Graw Hill 5 <sup>th</sup> Edition
03	V Chandra Sekar	Analog Communication	Oxford University Press
04	Roddy Collen	Electronic Communication	Prentice Hall India
05	Wayne Tomasi	Electronic Communication Systems	Pearson

**2. Websites:**

- 1) [en.wikipedia.org](http://en.wikipedia.org)
- 2) [www.masd.k12.pa.us](http://www.masd.k12.pa.us) ( Electromagnetic Spectrum)
- 3) [www.staff.ncl.ac.uk](http://www.staff.ncl.ac.uk) ( modulation & demodulation)
- 4) [circuitdiagram.net/am-radio-receiver.html](http://circuitdiagram.net/am-radio-receiver.html) (AM radio receiver circuit diagram)
- 5) <http://www.circuitdiagram.org/am-radio-receiver-with-mk484.html>
- 6) [www.circuitstoday.com/single-chip-fm-radio-circuit](http://www.circuitstoday.com/single-chip-fm-radio-circuit)

**List of equipments:**

1. CRO, Function generator, spectrum analyzer, DMM
2. AM,FM,PAM,PWM,PPM Modulation/ Demodulation trainer kits
3. Transmission line trainer kit/ Coaxial cable e.g. (RG174) -100mtrs.
4. Antenna demonstration kit/ Antenna for measuring its parameters

**Course Name** : Electronics Engineering Group  
**Course Code** : ET/EN/EX/EJ/DE/ED/EI/IS/IC/IE/IU  
**Semester** : Fourth  
**Subject Title** : Power Electronics  
**Subject Code** : 17444

**Teaching and Examination Scheme:**

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
03	--	02	03	100	25#	--	25@	150

**NOTE:**

- Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.
- Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work (SW).

**Rationale:**

Day by day the change in Electronics Industry is dynamic. The role of Diploma engineers changed over the years. Engineers should have concepts of industrial electronics. Electronic control circuits have major role in Industries for which study of power devices is essential.

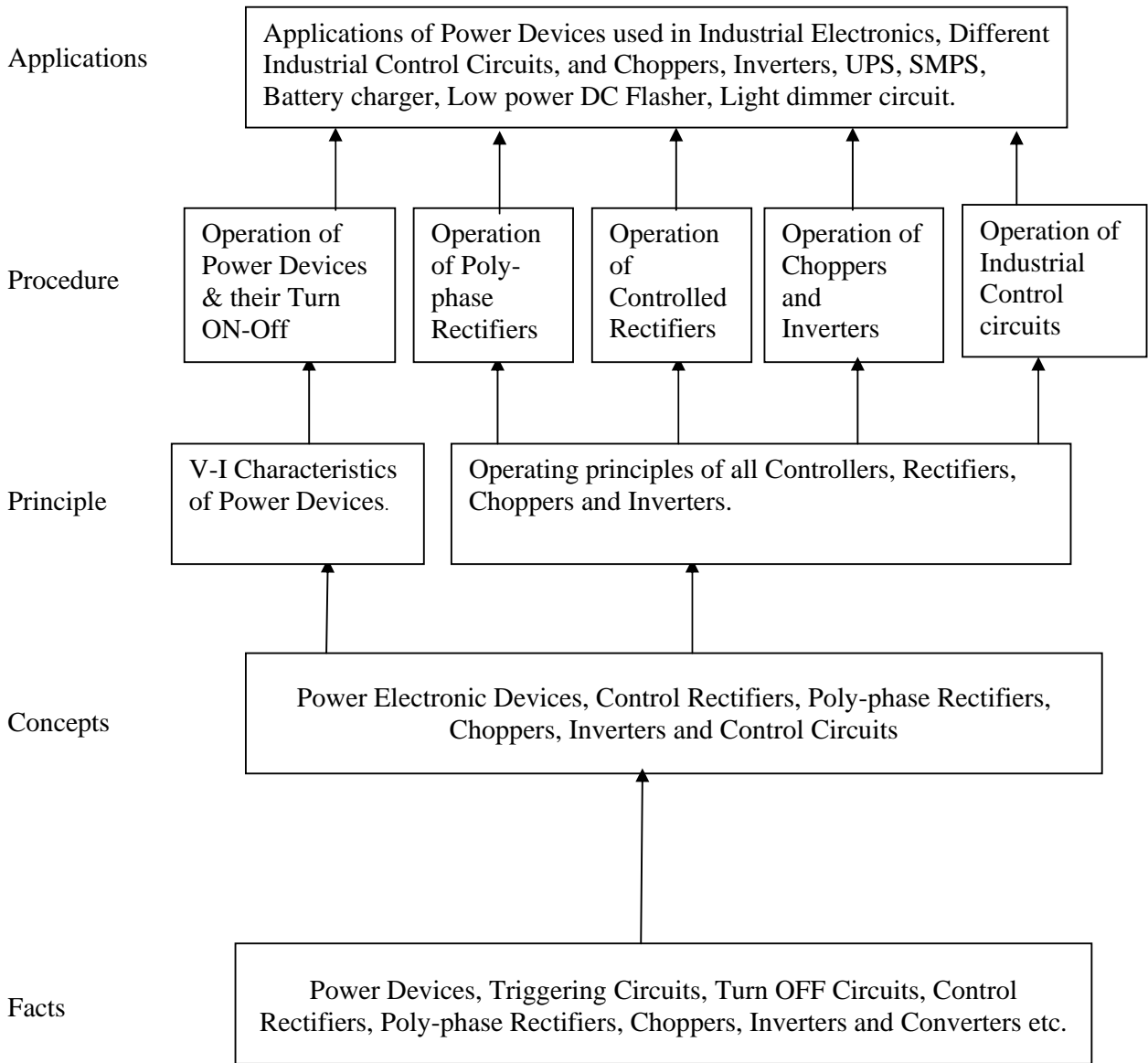
Concepts of electronic devices and circuits along with their applications are necessary. Industrial electronic is the foundation subject to study industrial drives, and advanced industrial electronics.

**Objectives:**

Students will be able to:

1. Understand construction and operating principle of various power electronic devices.
2. Study construction and operation of controlled rectifiers, choppers and inverter and industrial control circuits.

**Learning Structure:**



**Theory:**

Topic No	Contents	Hours	Marks
1	<p><b>Power Electronics</b>  <b>Specific Objectives:</b></p> <ul style="list-style-type: none"> <li>➤ <b>Realize construction, working principle of different Power Devices.</b></li> <li>➤ <b>To select proper power device for particular applications.</b></li> </ul> <p><b>Contents:</b></p> <ul style="list-style-type: none"> <li>• Introduction to power electronics.</li> <li>• Power transistor: Construction, Operating Principle, V-I characteristics and Uses of power transistors.</li> <li>• Power MOSFET- Construction, Operating Principle, V-I characteristics and Uses of Depletion and Enhancement type power MOSFET.</li> <li>• IGBT- Construction, Operating Principle, V-I characteristics and Uses of IGBT.</li> </ul>	04	10
2	<p><b>Thyristor Family Devices</b>  <b>Specific Objectives:</b></p> <ul style="list-style-type: none"> <li>➤ <b>Classify different power devices.</b></li> <li>➤ <b>Identify thyristors and triggering devices.</b></li> <li>➤ <b>Describe the operation of thyristor.</b></li> <li>➤ <b>Interpret V-I characteristics of different power devices.</b></li> </ul> <p><b>Contents:</b></p> <ul style="list-style-type: none"> <li>• SCR: Construction, Operating Principle with Two transistor analogy, V-I characteristics, Latching Current (<math>I_L</math>) and Holding Current (<math>I_H</math>). Applications of SCR, LASCR, SCS, GTO and TRIAC.</li> <li>• Thyristor family devices LASCR, SCS, GTO and TRIAC: Construction, Operating Principle, V-I characteristics and applications.</li> <li>• Triggering Devices- Construction, Operating Principle, V-I characteristics and applications of UJT, PUT, SUS, SBS and DIAC.</li> </ul>	10	20
3	<p><b>Turn ON and Turn OFF methods of SCR</b>  <b>Specific Objectives:</b></p> <ul style="list-style-type: none"> <li>➤ <b>Classify Turn ON and Turn OFF circuits.</b></li> <li>➤ <b>Compare low power and high power triggering circuits</b></li> </ul> <p><b>Contents:</b></p> <ul style="list-style-type: none"> <li>• Concept of Turn ON mechanism of SCR: High Voltage triggering, thermal triggering, Illumination triggering, dv/dt triggering Gate triggering of SCR.</li> <li>• Gate trigger circuits –Resistance triggering circuit, Resistance Capacitance triggering circuit (Operation, applications and limitations)</li> <li>• SCR triggering using UJT, PUT-Relaxation Oscillator circuit and Synchronized UJT triggering circuit: (Operation and applications).</li> <li>• Pulse transformer used in triggering circuit (Operation and applications).</li> <li>• Concept of Turn OFF mechanism and methods of - Class A-</li> </ul>	08	16

	Series resonant commutation circuit, Class B-Shunt resonant commutation circuit, Class C-Complimentary Symmetry commutation circuit		
4	<p><b>Phase controlled Rectifiers</b> <b>Specific Objectives:</b></p> <ul style="list-style-type: none"> <li>➤ Draw and explain concept of phase control.</li> <li>➤ Draw and interpret the phase control waveforms.</li> <li>➤ Derive the expression of average voltage of control rectifier.</li> <li>➤ Solve the numerical examples on control rectifier.</li> </ul> <p><b>Contents:</b></p> <ul style="list-style-type: none"> <li>• Concept of phase control. (Firing Angle <math>\alpha</math> and conduction angle <math>\emptyset</math>)</li> <li>• Circuit diagram, working, equations for and Waveforms of <math>V_{DC}</math> of following rectifiers.</li> <li>• Single phase half wave controlled rectifier with R, RL load. Effect of freewheeling diode.</li> <li>• Single phase centre tapped full wave controlled rectifier with R, RL load. Effect of freewheeling diode.</li> <li>• Single phase Bridge type full wave controlled rectifier with R, RL load. Effect of freewheeling diode.</li> <li>• Basic three phase half wave uncontrolled and controlled rectifier.</li> <li>• Need and Uses of Polyphase rectifier.</li> </ul>	16	24
5	<p><b>Converters</b> <b>Specific Objectives:</b></p> <ul style="list-style-type: none"> <li>➤ Understand the concept of Chopper.</li> <li>➤ Realize the concept of Inverter.</li> <li>➤ Explain operation of Chopper and Inverter.</li> <li>➤ List different applications of Chopper and Inverter.</li> </ul> <p><b>Contents:</b></p> <ul style="list-style-type: none"> <li>• Concept of Choppers</li> <li>• Chopper: basic circuit and its operation using MOSFET</li> <li>• Step Up and Step down Chopper using MOSFET basic circuits.</li> <li>• Inverters-Need of an inverter, Classification of inverters Important applications of inverter.</li> <li>• Working principle of single phase half bridge inverter.</li> <li>• Definitions of performance parameters of inverter.</li> </ul>	04	14
6	<p><b>Industrial Control Circuits.</b> <b>Specific Objectives:</b></p> <ul style="list-style-type: none"> <li>➤ Understand the concept of Industrial Control Circuits.</li> <li>➤ Draw the Circuit diagram and explain working of Industrial control circuits.</li> <li>➤ Draw the Block diagram and explain working of SMPS and UPS.</li> </ul> <p><b>Contents:</b> <b>Circuit diagram, working and applications of :</b></p> <ul style="list-style-type: none"> <li>• Low power DC flasher.</li> <li>• Light dimmer circuit using DIAC-TRIAC.</li> <li>• Electronic timer using SCR.</li> </ul>	06	16

	<ul style="list-style-type: none"> <li>• Battery charger using SCR.</li> <li>• Emergency Lighting System.</li> <li>• Temperature Controller using SCR.</li> <li>• Speed Control of fan using TRIAC.</li> <li>• Block diagram and Concept of UPS.</li> <li>• Block diagram and Concept of SMPS.</li> </ul>		
	<b>Total</b>	<b>48</b>	<b>100</b>

**Practical:**

Skills to be developed:

**Intellectual Skills:**

- 1) Selection of proper devices and instruments.
- 2) Interpretation of characteristics under various conditions.

**Motor Skills:**

- 1) Make accurate measurements.
- 2) Adjust proper firing angle.
- 3) Observe and draw the output waveforms
- 4) Conduct test on control circuits.

**List of Practicals:**

- 1) Plot output characteristics of power transistor.
- 2) Plot V-I characteristics of IGBT.
- 3) Determine the break over voltage using of DIAC.
- 4) Determine latching current and holding current using I-V characteristics of SCR.
- 5) Effect of variation of R, C in R and RC triggering circuits on firing angle of SCR.
- 6) Effect of variation of R in UJT Triggering technique.
- 7) Draw the output waveforms of three phase half wave Rectifier using diodes.
- 8) Draw the output waveform of half wave controlled rectifier with resistive load and determine load voltage.
- 9) Draw the output waveform of full wave controlled rectifier with resistive load, resistive-Inductive load, freewheeling Diode and determine load voltage.
- 10) Determine the effect of firing angle using DIAC and TRIAC on output power (using different loads such as bulb, motor or heater).



**Learning Resources:****1. Books:**

<b>Sr. No</b>	<b>Author</b>	<b>Title</b>	<b>Publisher</b>
01	Alok Jain	Power Electronics and Its Applications	Penram International Publishing (India) Pvt. Ltd.
02	S. K. Bhattacharya	Fundamentals of Power Electronics	ISTE Learning materials centre.
03	M D Singh K B Khanchandani	Power Electronics	Tata McGraw-Hill
04	Muhammad H. Rashid	Power Electronics Circuits Devices and Applications	Prentice Hall of India

**2. Websites:**

[www.vikaspublishing.com](http://www.vikaspublishing.com)  
[www.scitechpublications.com](http://www.scitechpublications.com)  
[www.tatamegrahill.com](http://www.tatamegrahill.com)  
[www.Phindia.com](http://www.Phindia.com)  
[www.pearsoned.co.in](http://www.pearsoned.co.in)  
[www.wileyindia.com](http://www.wileyindia.com)

**Course Name** : Electronics Engineering Group  
**Course Code** : ET/EN/EX/EJ/IE/IS/IC/DE/EV/MU/IU/ED/EI  
**Semester** : Fourth  
**Subject Title** : Linear Integrated Circuits  
**Subject Code** : 17445

**Teaching and Examination Scheme:**

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
04	--	02	03	100	50#	--	25@	175

**NOTE:**

- Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.
- Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work (SW).

**Rationale:**

Modern age technology has developed on high density and high speed electronics circuits. Integrated circuits are basis of these high density circuits enabled to reduce size, weight and cost of equipments. They have intrinsic features such as low power consumption, low noise and ease of design.

Today the growth of any industry depends upon electronics to great extent. Contents of this subject are the basic building blocks of different analog circuits.

Basic operating and designing principle of such a large collection of circuits establishes a foundation for understanding new development in the electronics field, instrumentation and power control. This subject acquaints student with general analog principles and design methodologies using integrated circuit for system design.

Prerequisites various devices and circuits studied in elements of electronics and electronic devices and circuits. Prospects- LSI, MSI, VLSI.

**General Objectives:**

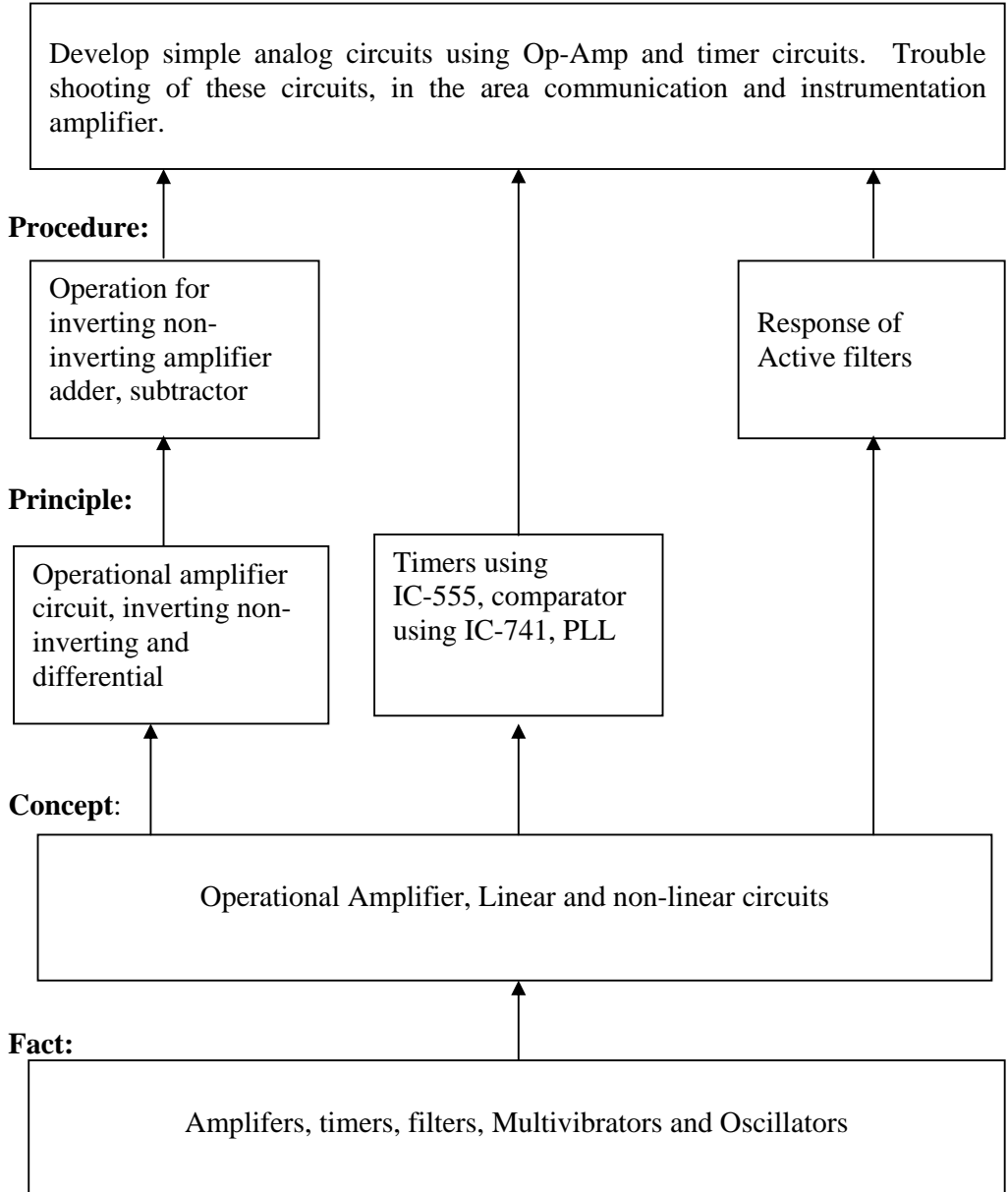
Students will be able to:

- Understand working principle of Op-Amp and IC555
- Develop electronics circuits using timer IC555 and Op-Amp

- Analyze the response of frequency selective circuits such as PLL with respect to the incoming signal.

**Learning Structure:**

**Application:**



**Contents: Theory**

<b>Topic</b>	<b>Content</b>	<b>Hours</b>	<b>Marks</b>
1	<p><b>Operational Amplifier (Op-Amp):</b> Specific Objectives :</p> <ul style="list-style-type: none"> <li>➤ Draw labeled block diagram of Op-Amp</li> <li>➤ Specify and define Different parameters of Op-Amp</li> <li>➤ Interpret ideal transfer characteristics of Op-Amp</li> </ul> <p>Contents:</p> <ul style="list-style-type: none"> <li>• Importance of Op-Amp: Block diagram of Op-Amp and function of each block with the circuit such as balanced, Unbalanced, differential amplifiers with simple current source, level shifter and complementary push-pull amplifier. Equivalent Circuit, Circuit Symbols And Terminals. Op-Amp IC-741 pin diagram and function.</li> <li>• Parameters of Op-Amp: Input offset voltage, Input offset current, Input bias current, differential input resistance, Input capacitance, Input voltage range, offset voltage adjustment range, Common Mode Rejection Ratio (CMRR), Supply Voltage Rejection Ratio (SVRR), large signal voltage gain and transfer characteristics, supply voltages, supply current, output voltage swing, output resistance, slew rate, gain bandwidth product, output short circuit current.</li> </ul>	12	10
2	<p><b>Op-Amp Configuration:</b> Specific Objectives: Students will be able to</p> <ul style="list-style-type: none"> <li>➤ Differentiate open and close loop configuration.</li> <li>➤ Identify inverting and non-inverting configuration.</li> <li>➤ Construct integrator and differentiator.</li> </ul> <p><b>2.1</b> Open loop and closed loop configuration of Op-Amp, [08] its comparison. Virtual ground, virtual short concept. Open loop configuration – Inverting , Non-inverting Close loop configuration – Inverting, non- inverting, differential amplifier, unity gain amplifier (voltage follower), inverter(sign changer)</p> <p><b>2.2</b> Inverting and non-inverting configuration of [10] Adders (summing amplifier, scaling Amplifier, averaging amplifier) Subtractor. Basic Integrator Basic Differentiator Basic concept of frequency compensation of Op-Amp and Offset nulling. Numerical based on designing of above circuit.</p>	12	18
3	<p><b>Applications of Op-Amp:</b> Specific Objectives:</p> <ul style="list-style-type: none"> <li>➤ Compute component values for instrumentation amplifier.</li> <li>➤ Explain IC LM-324</li> <li>➤ Explain different applications of Op-Amp.</li> </ul> <p><b>3.1</b> Need for signal conditioning and signal processing. [ 08]</p>	12	22

	<p>Circuit diagram, operation, derivation of output voltage Equation. advantages and applications of Instrumentation amplifier. Pin diagram pin functions and specifications of IC LM 324 Voltage to current converter (with floating load, with grounded load) Current to voltage converter.</p> <p><b>3.2 Sample and hold circuit.</b> [16]</p> <p>Logarithmic and antilogarithmic amplifiers (using Diodes) Analog divider and analog multiplier Comparator: Circuit diagrams and operation of</p> <ul style="list-style-type: none"> <li>• Zero crossing detector,</li> <li>• Schmitt trigger,</li> <li>• Window detector,</li> <li>• Phase detector,</li> <li>• Active peak detector,</li> <li>• Peak to peak detector</li> </ul>		
4	<p><b>Filters:</b> Specific Objectives:</p> <ul style="list-style-type: none"> <li>➤ Distinguish the types of filter</li> <li>➤ Explain active and passive filter</li> <li>➤ Explain different parameters of filter.</li> </ul> <p>Contents:</p> <ul style="list-style-type: none"> <li>• Introduction to filters ,Classification of filters,</li> <li>• Concept of passive and active filters</li> <li>• Merits and demerits of active filters over passive filters</li> <li>• Ideal and actual characteristics, terms: - cut off frequency, Pass band, Stop band, center frequency, roll off rate, BW, Q-factor, first order and second order Butterworth filters, order of filter, Low pass filter, high pass filter, band pass filter ( wide band pass , narrow band pass filter) Band reject filter(wide band reject, narrow band reject filter), all pass filter. Numerical based on design of different filters.</li> </ul>	10	16
5	<p><b>Timers</b> Specific Objectives:</p> <ul style="list-style-type: none"> <li>➤ Draw block diagram of IC 555</li> <li>➤ Understand industrial applications of IC 555 ,565</li> </ul> <p>5.1 Introduction to timer IC 555 [10]</p> <ul style="list-style-type: none"> <li>• Block diagram of IC 555 and its pin diagram and function of each pin.</li> <li>• Concepts of different timer circuits used in industries: water level controller, Touch plate switch, frequency divider.</li> <li>• Numericals based on timers.</li> </ul> <p>5.2 Phase Lock Loop</p> <ul style="list-style-type: none"> <li>• Principle of operation, block diagram of PLL. [08]</li> <li>• Applications of PLL as multiplier, FM demodulator.</li> <li>• Pin diagram and pin functions of IC 565(PLL)</li> </ul>	10	18

6	<b>Oscillators:</b> Specific Objectives: <ul style="list-style-type: none"> <li>➤ Explain concept of oscillators</li> <li>➤ Explain different types of oscillators</li> <li>➤ Develop multivibrators and oscillators for given values.</li> </ul> Contents: <ul style="list-style-type: none"> <li>• Concept of oscillators,</li> <li>• Types of oscillators: Phase shift oscillators, Wien bridge oscillators using IC-741</li> <li>• Types of Multivibrators: Monostable, Astable, Bistable using IC-555 and IC-741. Schmitt trigger, voltage controlled oscillator (VCO) using IC-555.</li> </ul>	08	16
	<b>Total</b>	<b>64</b>	<b>100</b>

**Practical:****Intellectual Skills:**

1. Interpret the waveforms.
2. Find faults in circuits.

**Motor Skill:**

1. Testing and Measurement.

**List of Practicals:**

Sr. No.	Title of the Experiment
01	Determine the op-amp parameters: <ul style="list-style-type: none"> <li>• Input Offset Voltage (<math>V_{io}</math>)</li> <li>• Output Offset Voltage (<math>V_{oo}</math>)</li> <li>• Common mode rejection ratio (CMRR)</li> </ul>
02	Determine the gain of Inverting and Non-inverting amplifier using op-amp and compare it with theoretical gain.
03	Verify the operation of Adder and Subtractor circuit using op-amp IC 741.
04	Verify the working of active integrator and differentiator circuits using op-amp IC 741 for following inputs: <ul style="list-style-type: none"> <li>• Sine waveform</li> <li>• Square waveform</li> <li>• Rectangular waveform</li> </ul>
05	Assemble V to I converter and I to V converter using IC 741 and measure the respective output.
06	Verify the working of following comparator circuits using op-amp IC 741 and draw the input-output waveforms <ul style="list-style-type: none"> <li>• Zero crossing detector</li> <li>• Active peak detector</li> </ul>
07	Assemble first order low pass Butterworth filter using op-amp and plot the frequency response and determine its cutoff frequency.
08	Assemble Astable multivibrator circuit using IC 741. Plot the output waveform and determine the frequency of oscillations and duty cycle.
09	Assemble Monostable multivibrator circuit using IC 555. Plot the output waveform and determine the on-time.
10	Assemble Schmitt trigger circuit using IC 555. Plot the output waveform and

	determine UTP and LTP
11	Assemble Instrumentation amplifier circuit using IC 324 and determine the overall gain.
12	Verify the operation of frequency Multiplier using PLL IC 565 and determine the output frequency.

**Learning Resources:****Books:**

<b>Sr. No.</b>	<b>Author</b>	<b>Title</b>	<b>Publisher</b>
01	K.R. Botkar	Integrated Circuit	Khanna
02	Ramakant Gayakwad	Op-Amps and Linear Integrated Circuit	PHI
03	Serigo Franco	Design with Operational Amplifier and Analog Integrated Circuit	Tata-McGraw Hill
04	Willam D. Stanley	Operation Amplifier with Linear Integrated Circuit	Person

**Course Name : Electronics Engineering and & Video Engineering Group**

**Course Code : ET/EJ/IE/IS/EN/EX/IC/MU/EV/DE/TU/ED/EI**

**Semester : Fourth**

**Subject Title : Visual Basic**

**Subject Code : 17043**

**Teaching and Examination Scheme:**

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
01	--	02	--	--	--	--	25@	25

**Rationale:**

Today's most of the electronically operated devices, integrated circuits, controllers, equipments, gadgets are run by specific drivers/software. To understand design, develop and write drivers programming knowledge is required. To run the devices software has to be user friendly. New approach is to use graphical user interface. Graphical user interface can be implemented using visual software's.

Traditionally visual basic is the most popular, versatile, suitable, simple and commonly used visual programming language to write efficient, compact and portable interfaces, drivers/software's.

The subject will enable the students to inculcate visual programming concepts and methodology used to write, debug, compile and execute simple visual basic programs using different powerful data types, built in visual controls and integrated visual basic environment (IDE) provided by Microsoft visual studio. Students will be exposed to event driven programming and bottom up approached used in objects oriented programming.

Students will understand how a complex interface can be easily implemented in visual basic with almost no programming expertise.

This course will lay the basic foundation of visual programming which will enable students to develop simple to complex programmable systems interfaces in the real world of work

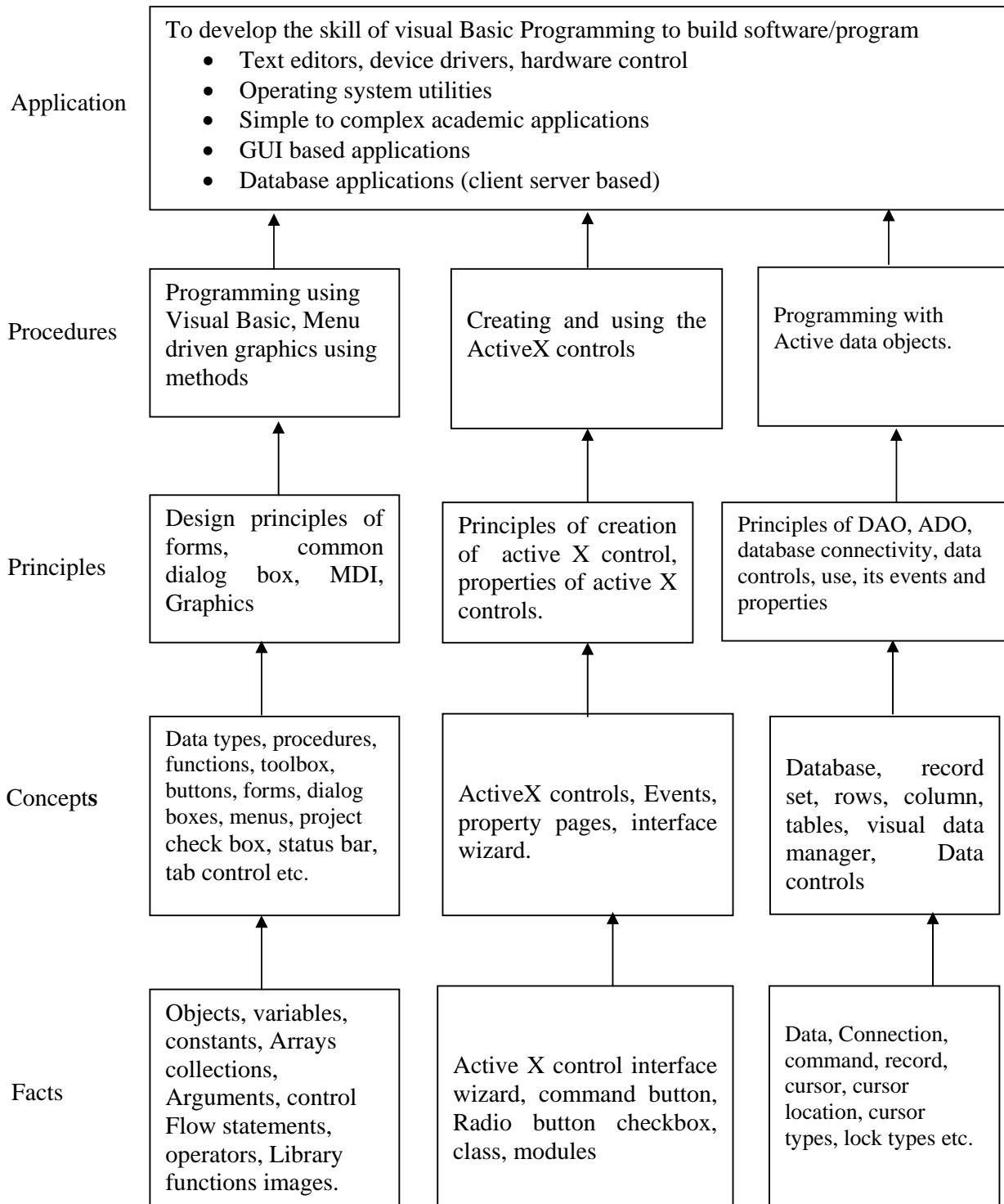
**General Objectives**

Students will able to.

1. Learn visual programming development environment, concepts and methodology.
2. Use essential components (visual tools ) of Visual software's
3. Develop the skill of visual basic programming to build custom standalone applications
4. Develop applications with Multiple documents interface ( MDI) using common dialog, menus and graphics
5. Use ADO for database connectivity with different databases.
6. Create simple reports using data report, Seagate crystal reports and integrating it with visual basic
7. Develop applications using class modules



**Learning Structure:**



## Theory

Name of Topics	Hours
<p><b>Topic 1] Introduction to Visual Environment</b>  <b>Specific Objectives:</b></p> <ul style="list-style-type: none"> <li>➤ Familiar with IDE of Visual basic</li> <li>➤ Use concepts of object based language</li> <li>➤ Use basic elements of visual interface</li> <li>➤ Use properties, events and methods at design time and runtime</li> <li>➤ Create objects, place them on forms</li> </ul> <p><b>Contents:</b></p> <p>1.1 Concepts of visual programming, object, features, properties, methods, events.  1.2 Environment of VB – Menu bar, toolbar, project explorer, toolbox, properties window, form designer, form layout, immediate window.  1.3 Concept of project, elements of projects, form, their properties, methods and events.</p>	02
<p><b>Topic 2] Introduction to Visual Basic</b>  <b>Specific Objectives:</b></p> <ul style="list-style-type: none"> <li>➤ Use different data types</li> <li>➤ Use powerful features of arrays and collections</li> <li>➤ Write procedures and functions</li> <li>➤ Call procedures and functions</li> <li>➤ Differentiate between procedure and functions</li> <li>➤ Use library functions for math and string operations</li> <li>➤ Use Inputbox and MsgBox functions</li> </ul> <p><b>Contents:</b></p> <p>2.1 Data types, variables, constants, arrays, collections  2.2 procedures, Arguments, function, return values, control flow statements, loop statements, Nested control structures, exit statement  2.3 Math operators &amp; formulas, logical operators, string functions, special functions available in VB like Input Box ( ), Message Box ( ), Format ( ).</p>	02
<p><b>Topic 3] Controls and Events</b>  <b>Specific Objectives:</b></p> <ul style="list-style-type: none"> <li>➤ Use basic controls</li> <li>➤ Select appropriate controls for given data</li> <li>➤ Set properties of different basic controls</li> <li>➤ Call methods and events of basic controls</li> <li>➤ Demonstrate the use of each control with simple examples</li> </ul> <p><b>Contents:</b></p> <p>3.1 Basic controls: Text box, list Box , Combo Box , Scroll Bar, frame , Option button, checkbox, command button, OLE controls  3.2 File, Drive, directory, Picture box, Image and timer controls .Designing a form using controls, concepts of event &amp; properties, changing properties (runtime &amp; design time) Important events of each control &amp; creating applications using controls.</p>	02
<p><b>Topic 4] Advance Controls &amp; Events</b>  <b>Specific Objectives:</b></p> <ul style="list-style-type: none"> <li>➤ Add extrinsic controls in an application</li> <li>➤ Use common dialog box control and its properties such open, save as, font, color, print and help</li> <li>➤ Use rich text box to design simple ms-word like application</li> <li>➤ Use and create explorer like utilities using tree view and list controls</li> <li>➤ Familiar with windows common controls</li> </ul>	03

<b>Contents:</b> 4.1 Common Dialog Box controls, The Tree view and List, View controls, the rich textbox controls 4.2 Windows common controls – status Bar, Tab control, image list control, Important properties, changing properties at design or run time, event handling.	
<b>Topic 5] Module, Class Module, Mdi, Menu Graphics</b> <b>Specific Objectives:</b> <ul style="list-style-type: none"> <li>➤ Write class modules</li> <li>➤ Define functions and procedures in class module</li> <li>➤ Access functions and procedures from class module</li> <li>➤ Use multiple document interface</li> <li>➤ Design menu based applications such as notepad editor</li> <li>➤ Work with graphic functions and methods</li> </ul> <b>Contents:</b> 5.1 Concept of module, class module, using class module to define functions, procedures, variables and accessing them using objects 5.2 MDI- MDI form and child form, Creation and use in 5.3 Menu: Creating own menu using menu editor, popup menu. 5.3 Graphics: Basic controls – Line & shape control , line method, circle method, Pset method, RGB ( ) Functions, Paint picture ( ) method, Load picture ( ) function.	03
<b>Topic 6] Database and Report</b> <b>Specific Objectives:</b> <ul style="list-style-type: none"> <li>➤ Create database</li> <li>➤ Use ADO and its properties, methods and events</li> <li>➤ Select appropriate concepts such as back-end and front-end</li> <li>➤ Make database connectivity with different databases</li> <li>➤ Generate report using Data Report and Crystal Report</li> </ul> <b>Contents:</b> 6.1 Concept of database, Record, Record set, Data control & its important properties 6.2 validating data, entering data, visual data manager. 6.3 Programming with ADO ( Active data objects ), using ADO Objects at design time-connection, command, record set , parameter, Creating & closing a connection; executing a command, 6.4 Using ADO Objects at run time, attaching visual controls to record set at run time, Using delete, save, search, update exit, new, add, methods. 6.5 Report generation using data report and crystal report	04
<b>Total</b>	<b>16</b>

**TERM WORK:-**

Sr No.	Name of the Experiments
1	a) Study and Understand Visual Basic Environment b) Develop VB Project which accepts User Name & Password using three forms Login Form1 and Form2 to accept data, and Form3 to display data.
2	Design simple calculator to perform mathematical function using Control array like Windows Calculator.
3	Design GUI to Find Resistor Value from it's color code.
4	Display student data using structure in loop. Implement it using Class module & Procedures

5	Demonstrate list boxes features with sorted list and selected item transfer facility.
6	a) Design Color box using RGB function to observe color change using H- scroll bar. b) Design project to demonstrate file, folder & drive controls to explore drive & folders.
7	Design GUI for Testing AC series Circuit
	<b>Practice Experiment / Exercise</b>
8	a) Design project to implement Common Dialog box controls such as open, save, Color, Font, Printer & Help b) Design a menu structure like notepad using menu editor
9	Design MDI application with 4 child forms & arrange forms with cascade, Tile Horizontal, Tile Vertical arrangements
10	Design student database project using ADO connectivity in design time and runtime and MS access as backend database engine, with basic features such as add, edit, update, save, cancel, delete feature and generate Report using Data Report / Crystal Report
11	Develop mini VB Project

**Reference Books:**

Sr. No.	Author	Title	Publisher
01	MSDN library on Line Reference	--	From Microsoft MSDN Library
02	Evangelos Petroustus	Mastering VB6	WILEY India
03	Steven Holzner	Visual basic 6	Dream Tech. Press
04	Content Development Group	Visual Basic 6.0 Programming	Tata McGraw Hill
05	Mohammed Azam	Programming with visual basic 6.0	Vikas Publishers
06	Nel Jerka	The complete reference VB6	Tata McGraw Hill Publishing

**Course Name : Electronics Engineering Group**

**Course Code : ET/EJ/EN/EX/IE/IS/IC/DE/EV/MU/TU/ED/EI**

**Semester : Fourth**

**Subject Title : Professional Practices-II**

**Subject Code : 17044**

**Teaching and Examination Scheme:**

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
--	--	03	--	--	--	--	50@	50

**Rationale:**

Most of the diploma holders join industries. Due to globalization and competition in the industrial and service sectors the selection for the job is based on campus interviews or competitive tests.

While selecting candidates a normal practice adopted is to see general confidence, ability to communicate and attitude, in addition to basic technological concepts.

The purpose of introducing professional practices is to provide opportunity to students to undergo activities which will enable them to develop confidence. Industrial visits, expert lectures, seminars on technical topics and group discussion are planned in a semester so that there will be increased participation of students in learning process.

**Objectives:**

To develop the following skills:

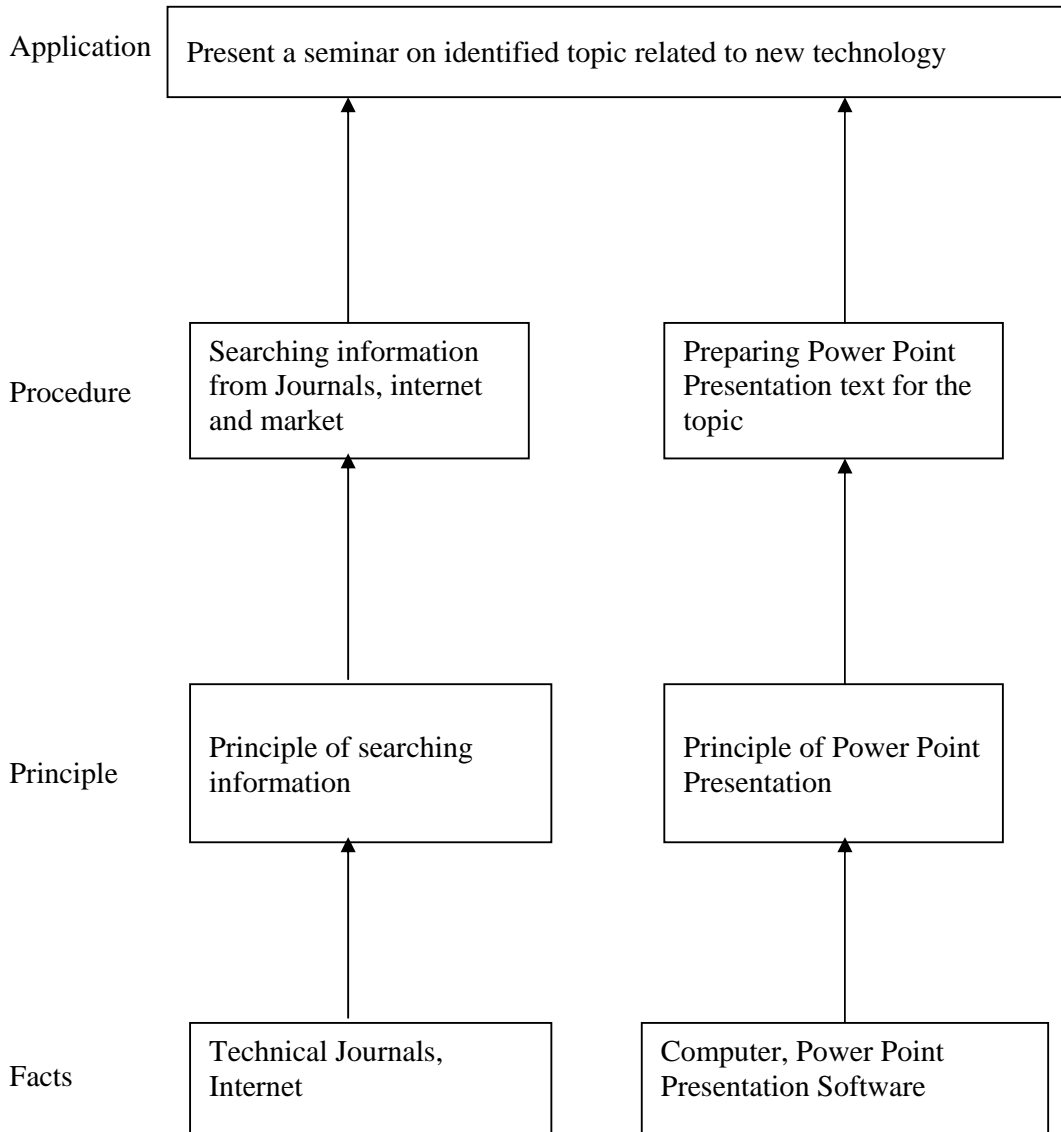
**Intellectual skills:**

- 1) Analyze information from different sources.
- 2) Prepare reports.

**Motor skills:**

- 1) Present given topic in a seminar.
- 2) Interact with peers to share thoughts.
- 3) Prepare a report on industrial visit, expert lecture.

**Learning Structure:**



**Contents:**

Activity	Content	Hours
1	<b>Industrial Visits</b> Structured industrial visits be arranged and report of the same should be submitted by the individual student to form a part of the term work. Minimum two industrial visits may be arranged in the following areas/ industries : i) Electronic equipment manufacturing unit ii) Resistance welding unit iii) Industrial automation unit iv) Sugar mill, Paper mill, Cement Industry. v) Railway station control room. vi) Telephone Exchange. vii) Any other suitable Industry.	16
2	<b>Lectures by Professional / Industrial Expert to be organized from any of the following areas (Any three)</b> i) Cyber laws. ii) Fiber optics communication system iii) Disaster management iv) Atomic energy v) Industrial Safety vi) Computer security systems/Ethical hacking. vii) Any other suitable topic viii) Introduction to Apprenticeship Training Scheme	08
3	<b>Information Search :</b> Information search can be done through manufacturers, catalogue, internet, magazines; books etc. and submit a report on one of the following topics: i) GPS ii) Market survey for motors used in electronic application iii) Electronic billing system. iv) Elevators installation and maintenance v) Any other suitable areas	06
4	<b>Seminar :</b> Seminar topic should be related to the subjects of fourth semester. Each student shall submit a report of at least 10 pages and deliver a seminar (Presentation time – 10 Minutes)	10
5	<b>Group Discussion:</b> The students should discuss in group of six to eight students and write a brief report on the same as a part of term work. The topic of group discussion may be selected by the faculty members.	08
<b>Total</b>		<b>48</b>

**Learning Resources:****1. Books:**

Sr. No.	Author	Title	Publisher
01	NRDC, Publication Bi	Invention Intelligence	National Research Development

	Monthly Journal	Journal	Corporation, GOI.
02	DK Publishing	How things works encyclopedia	DK Publishing
03	Trott	Innovation mgmt.& new product development	Pearson Education
04	E.H. McGrath, S.J.	Basic Managerial Skills for All – Ninth Edition	PHI
05	Apprenticeship Training Scheme:- Compiled By – BOAT (Western Region), Mumbai, Available on MSBTE Web Site.		

## 2. Web sites

[www.engineeringforchange.org](http://www.engineeringforchange.org)

[www.wikipedia.com](http://www.wikipedia.com)

[www.slideshare.com](http://www.slideshare.com)

[www.teachertube.com](http://www.teachertube.com)



**Course Name : All Branches of Diploma in Engineering & Technology**

**Course Code : AE/CE/CH/CM/CO/CR/CS/CW/DE/EE/EP/IF/EJ/EN/ET/EV/EX/IC/IE/IS/  
ME/MU/PG/PT/PS/CD/CV/ED/EI/FE/IU/MH/MI/DC/TC/TX/FG**

**Industrial Training (Optional) after 4<sup>th</sup> semester examination.**

**Note:- Examination in Professional Practices of 5<sup>th</sup> Semester.**

### **INDUSTRIAL TRAINING (OPTIONAL)**

**Rational:-**

There was a common suggestion from the industry as well as other stakeholders that curriculum of Engineering and Technology courses should have Industrial training as part of the curriculum. When this issue of industrial training was discussed it was found that it will be difficult to make industrial training compulsory for all students of all courses as it will be difficult to find placement for all the students. It is therefore now proposed that this training can be included in the curriculum as optional training for student who is willing to undertake such training on their own. The institutes will help them in getting placement or also providing them requisite documents which the student may need to get the placement.

**Details:-** Student can undergo training in related industries as guided by subject teachers / HOD.

- The training will be for four weeks duration in the summer vacation after the fourth semester examination is over.
- The student undergoing such training will have to submit a report of the training duly certified by the competent authority from the industry clearly indicating the achievements of the student during training. This submission is to be made after joining the institute for Fifth semester.
- The student completing this training will have to deliver a seminar on the training activities based on the report in the subject Professional Practices at Fifth Semester.
- The student undergoing this training will be exempted from attending activities under Professional Practices at Fifth semester except the seminar.
- The students who will not undergo such training will have to attend Professional Practices Classes/activities of fifth semester and will have to complete the tasks given during the semester under this head.
- There work will be evaluated on their submissions as per requirement and will be given marks out of 50. Or student may have to give seminar on training in Industry he attended.
- Institute shall encourage and guide students for Industry training.
- Evaluation:- Report of Training attended and delivery of seminar and actual experience in Industry will be evaluated in fifth semester under Profession Practices-III and marks will be given accordingly out of 50.